

65. (New) The method of claim 11 wherein annealing the solder contact further comprises annealing the solder contact to form a solder ball contact having a diameter of approximately 2.5 microns.

66. (New) The method of claim 15 wherein annealing the solder contact further comprises annealing the solder contact to form a solder ball contact having a diameter of approximately 2.5 microns.

67. (New) The method of claim 23 wherein annealing the solder contact further comprises annealing the solder contact to form a solder ball contact having a diameter of approximately 2.5 microns.

REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on March 31, 2000, and the references cited therewith.

Claims 1, 9, 12-13, and 16 are amended. New claims 64-67 are added, respectively depending from claims 8, 11, 15 and 23. Claims 64-67 are supported throughout the specification and particularly at page 12, lines 8-14. No new matter is introduced thereby. As a result, claims 1-23 and 64-67 are now pending in this application.

Applicant respectfully requests that this amendment be entered as it places the claims in condition for allowance and the alternative, simplifies the issues for appeal.

Rejections Under 35 U.S.C. §102(b)

At paragraph 3 of the Office Action mailed March 31, 2000, claims 1-7 and 12 were rejected under 35 U.S.C. §102(b) as being anticipated by Cook et al. (U.S. Patent No. 5,457,345). At paragraph 5 of the Office Action mailed March 31, 2000, claims 9-11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Cook et al. At paragraph 6 of the Office Action mailed March 31, 2000, claims 13-23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Cook et al. as applied to claim 1, and further in view of Strube et al. (U.S. Patent No. 4,650,548).

Applicant respectfully maintains that Applicant cannot find in Cook et al. a teaching or suggestion of depositing solder on an exposed portion of a metal contact pad using a deposition process selected from the group consisting of immersion contact, chemical vapor deposition and electrolytic deposition, thereby forming a solder contact in Cook et al. at col. 5, lines 1-10 and 37-49. Applicant also notes that at page 3, paragraph 5 the Office Action states that Cook fails to disclose the step of immersing the substrate in molten solder.

In the "Response to Arguments" section at paragraph 1 of the Final Office Action mailed September 26, 2000, the Examiner has clarified that Cook does not show immersion as a deposition technique, or a metal contact having a predetermined diameter. The Examiner relies on Thomas, U.S. 4,661,374 for a teaching that immersion is a common method for depositing solder. No individual elements of the pending claims of the present invention were cited or compared to the cited art by the Examiner in making this rejection. It is respectfully submitted that this makes Applicant's job difficult since it is difficult to speculate which claim elements the Examiner is finding in the Thomas patent. Applicant respectfully requests that the Examiner indicate which elements of the present claims correspond to which reference number of drawings and/or passages in the text of any prior art cited if the rejections of the claims are maintained after review of the remarks below.

Applicant has attempted to parse through the Thomas document and upon careful review thereof notes the following. Applicant respectfully notes that Thomas states at col. 3, lines 63-66, "Besides eliminating the photomasking operations involved in vacuum evaporation and electroplating, a solder reflow step is not required to spheridize the bumps 10--10." Thomas therefore teaches away from annealing as set forth in all of Applicant's claims. Further Thomas appears to teach successive immersion to increase the height of a solder bump, and is silent as to diameter of a via or the diameter of a solder bump. However, Applicant submits that Thomas appears to refute the Examiner's contention that "a via will inherently form a predetermined diameter, corresponding to the width/length of the via." Applicant respectfully maintains that Cook does not read on these limitations of Applicant's claims. Applicant also submits that a prima facie case of obviousness is not made by Cook and Thomas.

However, Applicant has amended claims 1 and 12 to state that annealing comprises annealing to form a solder ball contact having a diameter in the range of about 2.5 microns to no

greater than 100 microns. This is supported throughout the specification and particularly at page 12, lines 8-14. Applicant has also amended claims 9, 13 and 16 to include this limitation.

A claim is anticipated only if each of the limitations of the claim is included in the reference. At page 3 paragraph 5 of the Office Action mailed March 31, 2000, it is stated that Cook et al. fail to disclose the limitation of immersing the substrate in molten solder, as is set forth in claim 1. The Office Action also states at page 3, paragraph 5 that Cook et al. fail to disclose the limitation of forming and exposed portion of the metal contact pad having a specific diameter, as is now set forth in claims 1 and 12. Applicant further cannot find in Cook the limitation of a solder ball contact having a diameter of about 2.5 microns to no greater than 100 microns. It is submitted that Thomas teaches away from annealing, i.e., "a solder reflow step is not required to spheridize the bumps". Thomas further teaches away from vacuum evaporation and electroplating. It is believed in light of the Examiner's reliance on Thomas that its antithetical teachings must also be considered.

Claim 1 and claims 2-7 depending therefrom, and claim 12 as clarified by the foregoing amendments to claims 1 and 12, patentably distinguish over Cook et al. Withdrawal of the stated rejection of these claims is respectfully requested.

Applicant submits that Cook et al., either singly or in combination with Strube et al. and/or Thomas, fail to establish all of the elements of claims 13-23. The Office Action mailed March 31, 2000 states at page 3, paragraph 5 that Cook et al. fail to disclose the limitation of forming an exposed portion of the metal contact pad having a specific diameter. Applicant notes further that this limitation is also present in claims 1-8, 11, and 12 which are believed to patentably distinguish over the cited combination of references.

Like the methods set forth in claims 8 and 11, the methods set forth in claims 15 and 23 recite forming an exposed portion of a contact pad having a diameter of approximately 2 microns. Applicant cannot find such a method in Cook et al., Strube et al., Thomas, or any combination thereof. New claims 64-67 respectively depending from claims 8, 11, 15 and 23 likewise patentably distinguish over the cited combination.

Applicant further notes that the methods set forth in claims 1-8, 9-10, 12, 13-14, has amended claims 1 and 12 to state that annealing comprises annealing to form a solder ball contact having a diameter in the range of about 2.5 microns to no greater than 100 microns. This

is supported throughout the specification and particularly at page 12, lines 8-14. Applicant has also amended claims 9, 13 and 16 to include this limitation.

Applicant further notes that the methods set forth in claims 1-8, 9-10, 12, 13-14, 16-22 and new claims 64-67 include the limitation of annealing a solder contact to form a solder ball contact having a diameter in the range of about 2.5 microns to no greater than 100 microns. Applicant cannot find in Cook et al., Strube et al., Thomas, or the combination thereof, such a method.

Applicant considers additional elements and limitations of Applicant's claimed invention to further distinguish over the cited references, and Applicant reserves the right to present further arguments to this effect at a later date.

In view of the foregoing, withdrawal of the stated rejection is respectfully requested.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at 612-371-2148 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

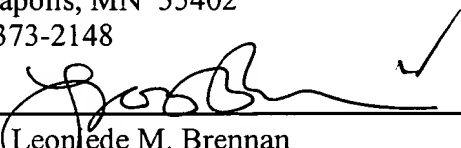
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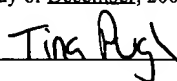
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By


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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 21 day of December, 2000.

Name



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